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Evaluation of Unix-Based Integrated Office Automation Products

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13. ABSTRACT *(Maximum 200 words)*

This paper documents the evaluation of three UNIX-based Office Automation software packages. The three products include Applix Aster*x, Clarity Rapport and BBN Slate. A similar effort completed by a MITRE-Washington technical support member is also incorporated, providing additional background information on each of these products and related conclusions. Where the two evaluations were performed on different versions of the products, conflicts have been resolved and explained. Detailed user interface and functional requirements were gathered through interviews with USMC Intelligence Activity Detachment, Quantico analysts and administrators.

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TABLE OF CONTENTS

SECTION PAGE

LIST OF FIGURES

LIST OF TABLES

SECTION 1

INTRODUCTION

1.1 PURPOSE

This document provides the results of an evaluation of three UNIX-based integrated Office Automation (OA) systems running under the X Window System (referred to as X) and supporting the Motif Graphical User Interface (GUI). The three systems included in this evaluation were Aster*x from Applix, Incorporated, Rapport from Clarity Software, Incorporated, and BBN Slate from Bolt, Beranek, and Newman, Incorporated (BBN) Software Products. The purpose of the evaluation was to provide a detailed assessment of the product features and highlight their differences.

1.2 BACKGROUND

In fiscal year 1991, the United States Marine Corps Intelligence Center (MCIC), now known as the United States Marine Corps Intelligence Activity (MCIA), embarked on an incremental development program with ESC/MITRE to prototype a state-of-the-art intelligence system. An initial operational capability (IOC) of the Marine Corps Intelligence Center Intelligence System (MCICIS) was reached in January 1992 at the MCIC in Quantico, Virginia.

Currently, the MCIA intelligence detachment in Quantico uses the MCICIS to provide day-to-day automated data processing (ADP) support for the generation of intelligence products such as messages, reports, and briefings. The MCICIS is a collection of network and computer equipment, system administration tools, and commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) software applications that facilitate access to both classified and open source intelligence data, which includes messages, text, images, and maps.

Since IOC, analysts have been using BBN Slate as their main OA product. In fiscal year 1992, the MCIA tasked ESC/MITRE with selecting an OA package to better meet their need to produce intelligence products. MITRE recommended Aster*x and Rapport as the best and second best OA package for the MCIA. MITRE installed both products for hands-on evaluation by the analysts. They chose Aster*x for its intuitive use and overall look and feel. The MCIA is currently using Aster*x with satisfactory results. Aster*x provides analyts with multimedia document publishing capabilities (i.e., word processing, graphics, spreadsheet, and e-mail).

1.3 APPROACH

First, MITRE documented the analysts' requirements in a rank-ordered list by function and by module. This list and the detailed descriptions of each feature formed the basis for the ensuing evaluations.

Then, MITRE surveyed the current market for integrated OA software packages capable of providing all the necessary capabilities sought by the analysts.

1.4 EVALUATION SCOPE

This evaluation dealt with the three integrated OA products mentioned above. The common denominators of all integrated OA systems were:

- A consistent user interface among component modules.
- Data compatibility that permits the exchange of data, text, and graphics between program modules.
- Import and export filters that allow the interchange of data with third party applications.

Each of the vendors use a different approach to integrate component modules. At one end of the scale, vendors bundle stand-alone products and market them as an integrated package. The result is a package with loosely integrated components. At the other end of the scale, some product designs so tightly integrate the components that it feels like a single application. The products considered for this evaluation cover the full range of integration approaches. Each of the integrated OA systems evaluated contains a text editor component for word processing, graphics component for drawing and presentation graphics, spreadsheet component, and e-mail. The word processing, spreadsheet, graphics processing, and e-mail components of the products were evaluated to determine the strengths and weaknesses of each.

1.5 ACKNOWLEDGMENT OF SIMILAR EFFORTS

A similar effort of evaluating four integrated OA packages, Clarity Rapport, BBN Slate, Applix Aster*x, and Island Graphics Write, Paint and Draw was performed by the Workstation Systems Engineering Center (W033). The results of that evaluation are incorporated in this document and are expanded to focus on the specific functional needs of the MCIA analysts.

1.6 ORGANIZATION OF THIS DOCUMENT

Section 2 provides some background information on each product evaluated and an explanation of the areas of evaluation. It also includes an explanation of the priority ranking of requirements and the grading system used to evaluate the features. Section 3 provides the results of the integrated OA product evaluation. Section 4 provides a summary.

SECTION 2

EVALUATION CRITERIA FOR OFFICE AUTOMATION SOFTWARE

2.1 PRODUCTS CONSIDERED

Aster*x, Rapport, and BBN Slate are the leading competitors in the field of UNIX-based multimedia integrated OA because they incorporate a suite of office tools including spreadsheet and e-mail components. Each of the products, even though they are competitors, have a slightly different market focus and emphasis. This evaluation examined Aster*x version 2.0, Rapport version 1.13, and BBN Slate version 2.0 beta release.

Aster*x evolved from an earlier Applix product called Alis, which was a character-based OA system, to an object-oriented design in January of 1991. Aster*x's strength is document preparation; the word processing capabilities approach those of high-end stand-alone products that contain some desktop publishing features. The Aster*x components are loosely integrated; each is like a distinct application with a GUI similar to the other components. It is possible, however, to use the spreadsheet and graphics applications from within the word processing application by creating an "inset" in a document. Applix has recently added an optional e-mail component and has begun to market Aster*x as an integrator of third-party applications. Aster*x was written using Applix's Extended Language Facility (ELF), which is an incrementally compiled language with syntax similar to the C programming language, and a set of high-level tools [1]. System integrators sometimes use these tools to incorporate Aster*x components into other systems.

Rapport was originally designed using object-oriented technology with an emphasis on interoperability with networked users, integration of other software applications, and file format conversion. Clarity Software was founded in January of 1990 specifically to develop this product. To the company's credit, Rapport was selected by *UNIX World* as one of the top ten products of 1991, based on the criteria that the product (1) significantly contributes to productivity and (2) represents a technological achievement [2]. The e-mail component is an integral part of Rapport's design because of Rapport's focus on interoperability with UNIX, PC, and Macintosh platforms. The components of Rapport are tightly integrated. It feels like a single application with distinct capabilities, rather than distinct applications that are bundled together. A switch from using text with the word processor to using drawing tools, image tools, spreadsheet, or audio is accomplished by clicking on the appropriate icon, which changes the window menus to reflect the actions available for that medium. Rapport was written in the C++ and C programming languages.

BBN Slate excels in the document conferencing arena with a focus on sharing and collaborating on multimedia documents with other BBN Slate users in a homogeneous environment. BBN opted for a tightly integrated design with little interoperability with other software applications. BBN advertises BBN Slate as a multimedia document communication system for work groups. Apparently one of BBN's largest markets are system integrators who incorporate BBN Slate into other systems using the Slate Extension Language (SEL). BBN Slate, which was originally developed as Diamond for the government, was rewritten in 1989 for Sun Microsystems' Sunview interface, and still reflects those origins. The interface

is currently very cumbersome and inconsistent. BBN's beta release of version 2.0, which supports the Motif GUI was evaluated for this effort. However, BBN's development philosophy is to develop in the OpenLook environment and then port to the Motif environment. This evaluation was performed in Motif and did not provide satisfactory results. The beta software behaved unreliably, crashing numerous times, and many functions could not be tested due to a lack of documentation and sufficient on-line help. Some functions would not operate correctly in the beta version. That coupled with the negative reception by the MCIA analysts, basically put BBN Slate out of the running early on.

2.2 AREAS OF CRITERIA

The evaluation criteria are divided into three major areas: operational, functional, and vendor and other.

The operational evaluation criteria focused on the hardware and operating system environments, the different modules available, and any user features that were not directly related to any specific function of the OA package. It also included the interoperability issue between the OA package and other applications and hardware in MCIA.

The functional evaluation criteria are organized by module or area of capability (i.e., word processing, spreadsheet, graphics processing, e-mail) with some features being addressed on a package-wide basis (i.e., printing, file manipulation). Some features were further defined by detailed requirements that are prioritized.

Vendor and other evaluation criteria include vendor's stability, vendor's responsiveness, maturity of product, and the evaluator's subjective impressions of the product.

2.3 PRIORITIZATION AND GRADING OF REQUIREMENTS

Within each module, a number of features are prioritized using the letters A, B, and C. "A" means that the feature is necessary for the product to be seriously considered as an alternate. "B" means that the feature would be extremely advantageous if available. "C" means that the feature would be desirable to have. If a product is unable to meet an "A" criteria, than an alternate solution would need to be defined to fulfill that feature. Some of the features having no priority are included from the MITRE-Washington evaluation results.

In addition to the A, B, and C priorities, a grading system was used to define the degree of acceptability. This system uses checks (i.e., √, √+, or √-) or X's to denote acceptability or unacceptability. The grading system is defined as follows:

- √ Acceptable, meets requirement
- √+ Acceptable, exceeds requirements
- √- Acceptable, with some limitations, possibly annotate a work around solution
- X Unacceptable, product cannot meet requirement.

SECTION 3

EVALUATION RESULTS

3.1 OPERATIONAL EVALUATION RESULTS

Operationally, the products must be integrated in an existing hardware and software environment. Future implementations at other sites require that these systems be compatible with all Department of Defense Intelligence Information Systems (DODIIS) hardware and software. An overall look at the modules and their presentation was performed. Special features include the extensibility, customizability, or efficiency of the user interface.

3.1.1 Hardware Platforms Supported

Operationally, the MCIA is based on a suite of hardware including IBM RS6000 servers, Sun SPARCstation servers, and Sun SPARCstation (1+ and 2) workstations. The wider Department of Defense Intelligence community includes the DEC Station 3000/5000 and Macintoshes running the A/UX operating system. Therefore, it is important to ascertain the support for these different platforms or the vendor's commitment to supply this support in the near future. Both Aster*x and BBN Slate support Suns, IBMs and DECs, while Rapport is promising support by the next product release currently due out (in beta test) in the fall of 1992. BBN Slate will be discontinuing their support for VAX since DEC is also discontinuing it.

Table 3-1 provides information on hardware platforms that are supported.

3.1.2 Modules Available

Table 3-1 also provides an overview of the modules provided in each integrated OA package. All of the products provide a similar set of modules, including word processing, spreadsheet, graphics processing, and e-mail. Rapport includes an additional module called the Slide Manager that provides presentation graphics capabilities. BBN Slate provides most of these modules bundled for a single price while Aster*x breaks out certain modules at an additional charge. Both BBN Slate and Aster*x are able to do presentation graphics but do not have a slide production module. A specific breakout of pricing is provided later in this document.

The manner in which individual components interact with one another among the evaluated products is very different. Aster*x uses a different window and menu for each type of document (e.g., word processing, spreadsheet, graphics) and each is launched as a separate application as shown in figure 3-1. They are launched either from the Aster*x main menu, which opens automatically in a separate window, or from the Aster*x menu within each component. After double clicking the word processing icon, the Aster*x word processing module is invoked as shown in figure 3-2. Rapport uses an in-place editing approach in which each of the object editors work in the same window and the menu changes to reflect the object being edited as shown in figure 3-3. The individual components are represented by icons at the top of the document window. BBN Slate uses one main editor window for

Table 3-1. Office Automation Package Comparison

Feature (Priority)	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
UNIX Platforms Supported			
(A) Sun SPARCstation or compatible	√	√	√
Sun 3	√	X	√
Sun 4	√	√	√
(A) DEC Station 3000/5000	√	Future	√
(A) IBM RS6000	√	Future	√
(B) VAX (Ultrix)	X	X	√
(C) HP 9000/300, 400, 700 series	√	√	X
(C) Silicon Graphics IRIS series	√	√	X
PC (SCO)	√	X	X
Integrated Modules			
(A) Word processor	√	√	√
(A) Spreadsheet	√ Extra Cost	√	√
(B) Presentation graphics	√	√+	√
(A) Drawing/image package	√	√	√
(A) Electronic-mail	√ Extra Cost	√	√
(B) FAX interface	√*	√ Extra Cost	Future
Special Features			
(A) Programming extension language	√	X	√
(A) Menu/interface customization	√+	√-	√
(A) Context-sensitive help	√	√	√
(A) On-line documentation (tutorial)	√	√	X
(A) Keyboard accelerators	√	√	√
(A) Macros	√	X	√
(B+) Audio support	√	√	√
(B) Hypermedia	√	√	√-
Third-Party Hardware/Software Integration			
(A) Supports MCIA hardware (Scanners)	√	√	√
Menu integration (UNIX)	X	√	X
(A) Inset encapsulation (DOS/Mac/UNIX)	√*	√	Future
System Requirements			
RAM	12-16 MB	16 MB	8 MB
Disk Space	23-45 MB	45 MB	10-15 MB
Swap Space	10 Mb/user	formula@	8-10 MB
Graphical User Interface			
(A) Supports Motif	√	√	√-buggy
(B) Supports OpenLook	√	√	√
(B) Supports X11R4 or X11R5	R4	R4	R5

* Requires programming extension language
@ Rapport's swap space is figured (2 times the RAM + (15 MB times the number of users))

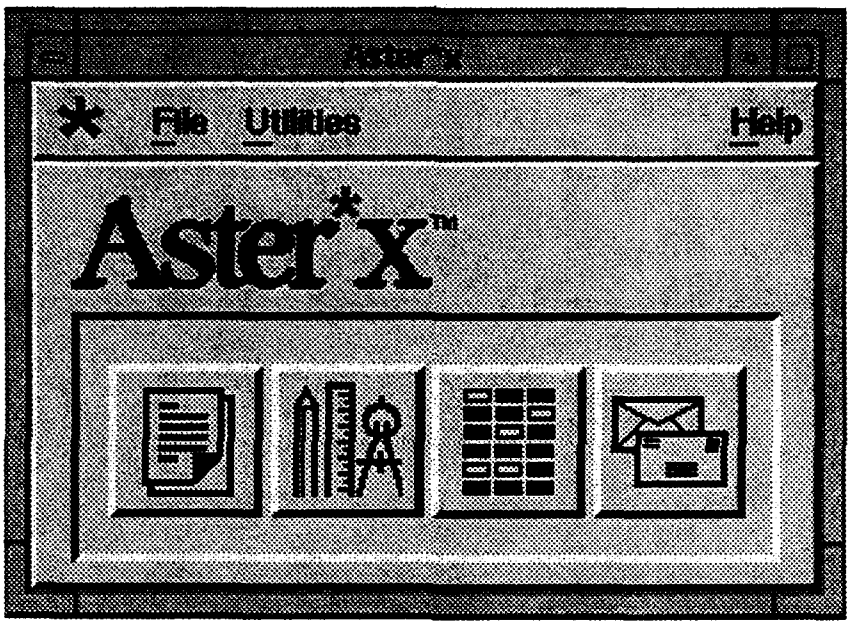

Figure 3-1. Aster*x Main Menu

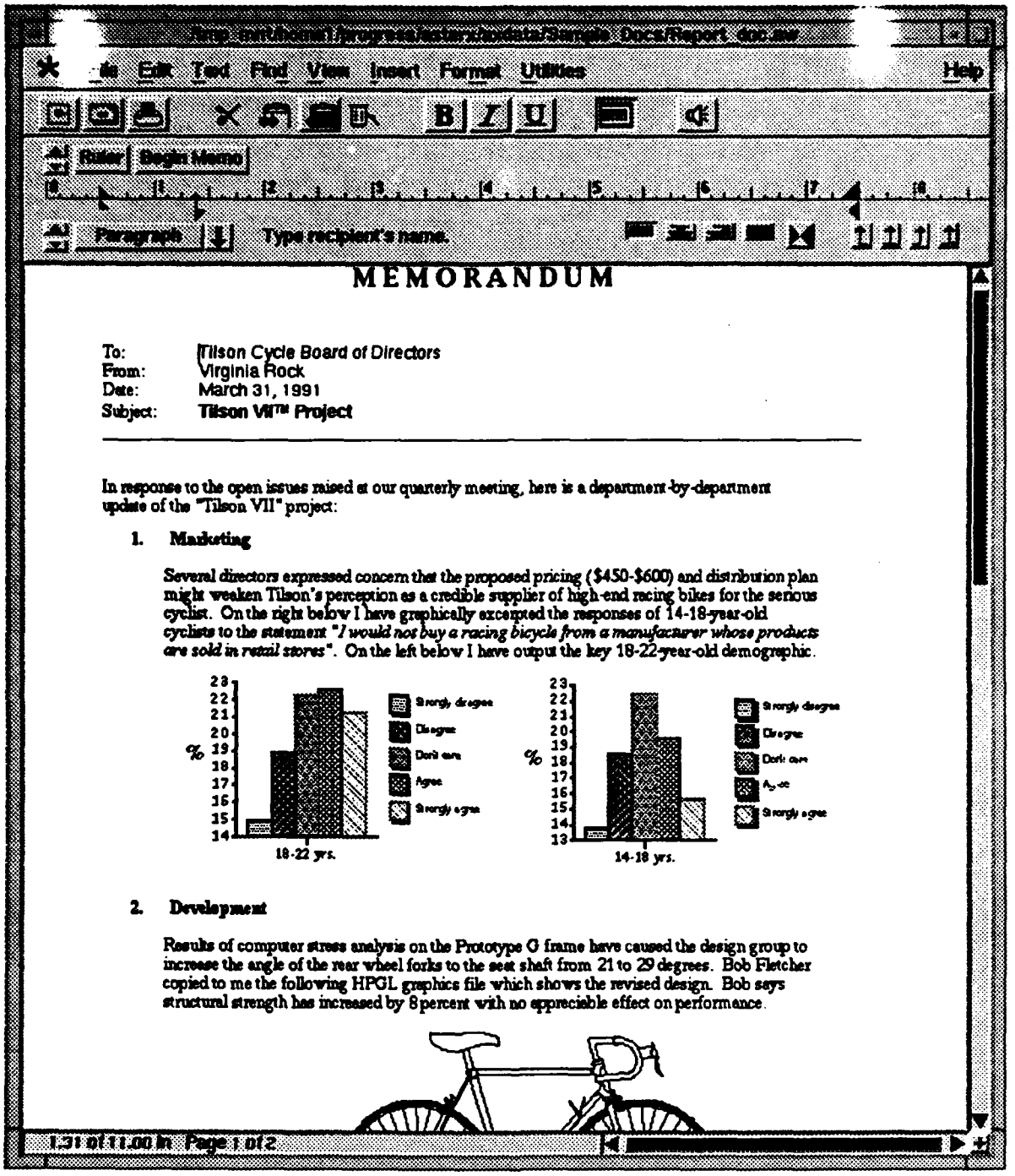

Figure 3-2. Aster*x Word Processing Module

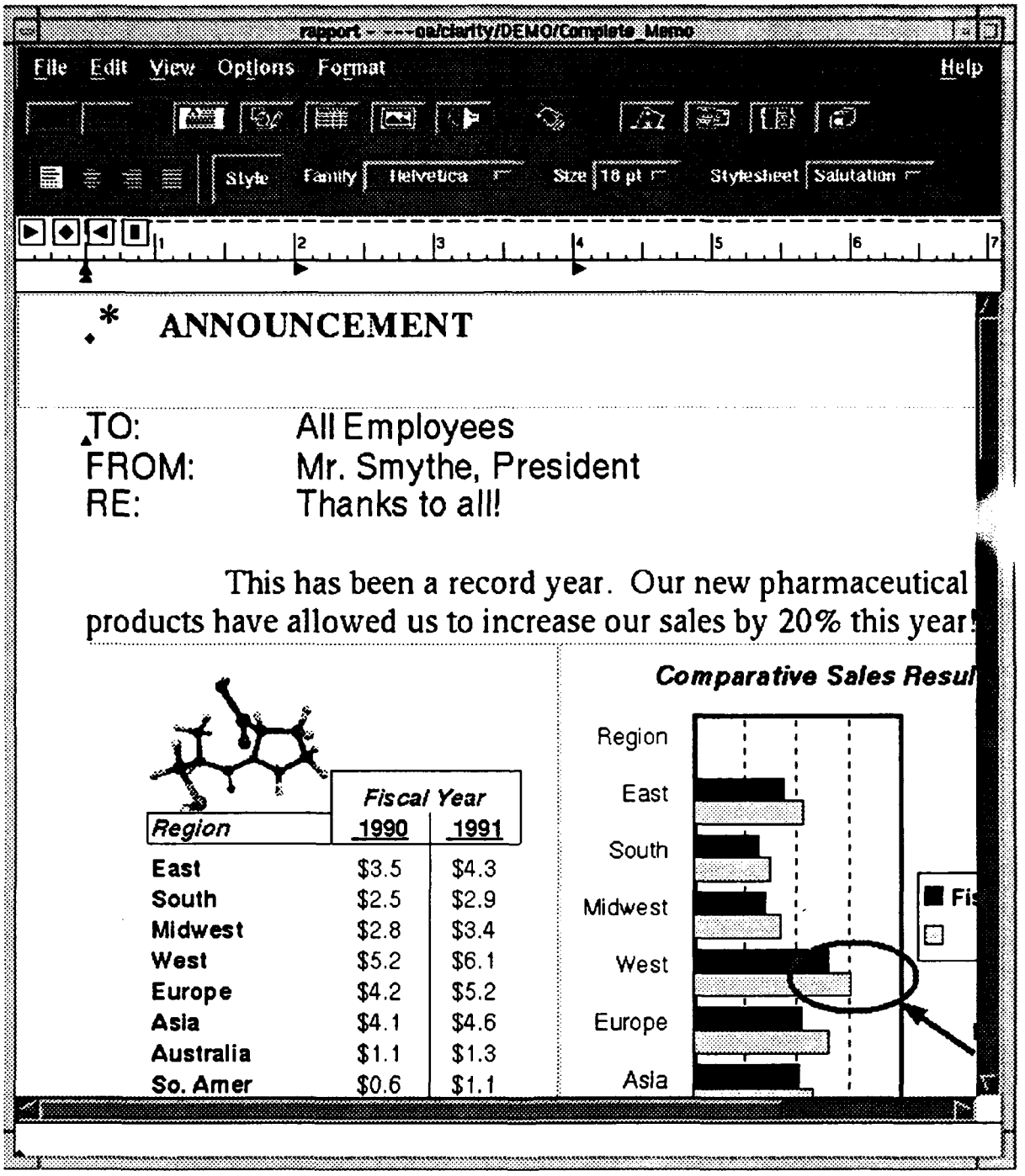

Figure 3-3. Rapport Integrated Office Automation Interface

document creation, and nontext objects are confined within a rectangular area. The menu bar provides a choice of components (e.g., word processing, graphics, spreadsheet) by push button icons as shown in figure 3-4. Only one document window may be opened at a time in BBN Slate.

Clarity provides a separate module for FAX support that can be integrated with the Rapport product or used as a stand-alone. Aster*x is also able to integrate FAX support using it's programming language (ELF).

3.1.3 Special Features

The next section of table 3-1 provides a list of special features that do not pertain to the operation of a specific module or function, but rather add to the extensibility, customizability, and efficiency of the product.

Aster*x and BBN Slate offer flexibility through their support for interface customization and extensions to the base products by their programming languages. These extension languages offer the potential for more functionality, but are more difficult to use and usually require programmer support. In fact, as mentioned earlier, integration contractors often use these languages to extend the basic functionality of BBN Slate and Aster*x. Aster*x does, however, provide some tools intended for end-user customization, such as a dialogue box editor and a menu bar editor (so that a user can customize the interface), as well as keystroke recording for user-created macros, to reduce the number of keystrokes or menu operations needed to perform often-used tasks.

Rapport has a "Fast Menu" feature. The Fast Menu (also referred to as the "expert" and "smart mouse" feature) contains frequently used functions, such as undo, copy, cut, and paste, and is accessed by depressing the right-most mouse button. All of the evaluated products have keyboard accelerators to bypass the menu system.

Rapport offers the ability to easily integrate other UNIX applications and interoperate with Macintosh and DOS users in a networked environment. However, a macro facility for keystroke recording or built-in macros would be a desirable feature.

The context-sensitive help facility for both Aster*x and Rapport is good, allowing applicable help information to be accessed without searching through a list of topics. Rapport's on-line documentation is an excellent added feature. However, the topics are presented in a "table of contents" fashion, and at times it is useful to have an index. It is also possible in Rapport, to search for help using keywords. The help facilities in Aster*x and Rapport permit ordinary document processing to be accomplished without referring to a manual. BBN Slate help facilities provide minimal information and no on-line tutorial.

Macros, menus and interface customization, and the programming extension language facility are all features that extend the use of the product beyond normal everyday operation. It is

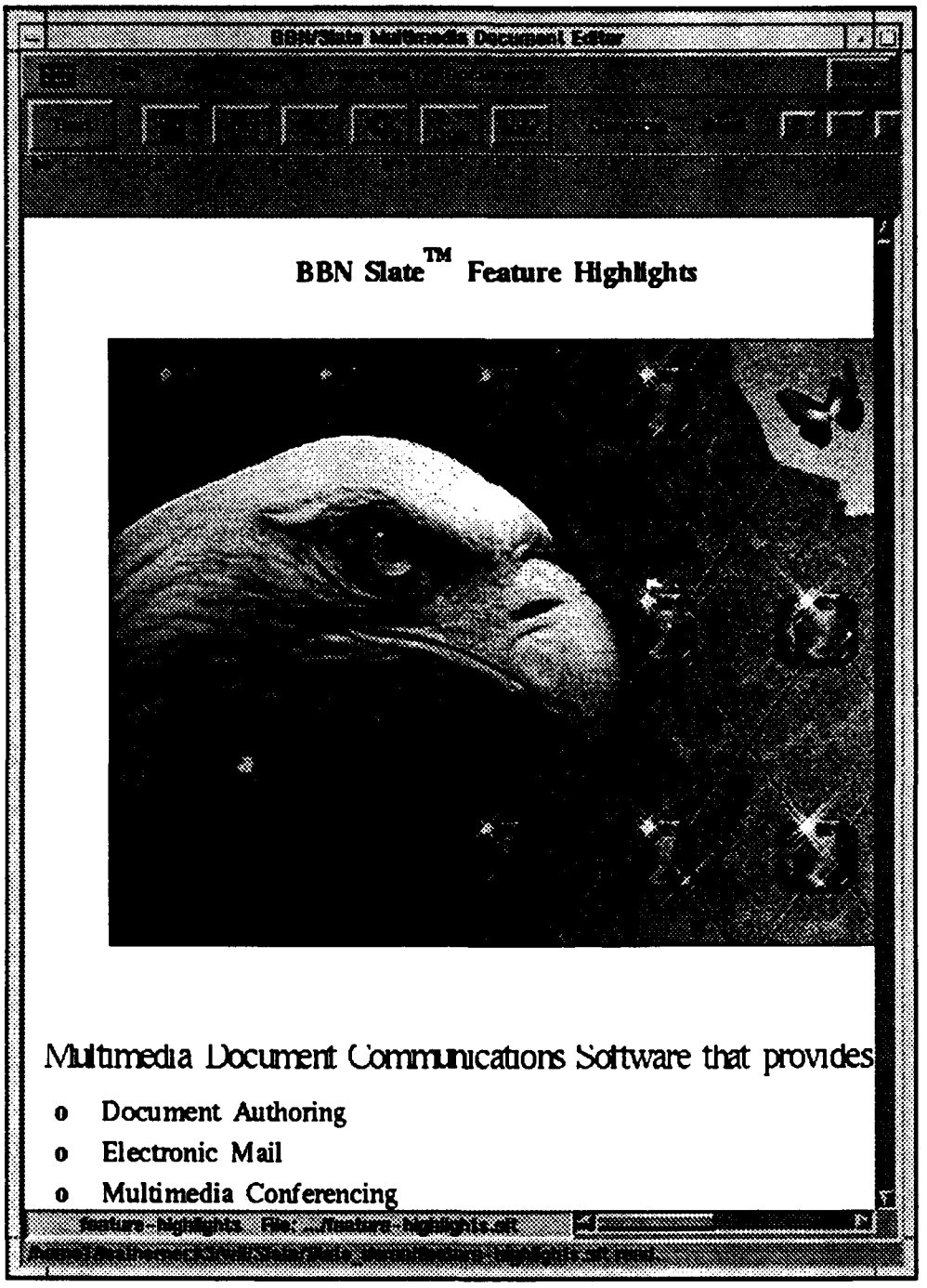

Figure 3-4. BBN Slate Integrated Office Automation Interface

clear that currently Rapport lacks much of the customizability and extensibility that are built-in features of the other two products. These extension languages are explained further in the next section.

Audio support is provided in all products with varying degrees of volume control. Aster*x, BBN Slate, and Rapport each have a menu option for recording sound input. By simply placing a sound icon in the document and double clicking on it, the user can listen to previously recorded sounds.

3.1.4 Third-Party Hardware/Software Integration Methods

Although the developers of Aster*x, Rapport, and BBN Slate have a common goal of letting the end-user share and manipulate data from other applications (e.g., WordPerfect or Lotus 1-2-3), the methods used and the results are quite different. Two approaches are used to "integrate" other applications with compound documents. The first is to encapsulate an inset from another UNIX application into a document. This involves invoking a UNIX window at a specified point in a document, running another application, and pulling data from that application into the document, thus creating a "hot" link to another application. The data integrated in this manner is merely referenced, and if the document was mailed to another user, the inset data would be transmitted as a separate file attached to the document. The software developers of these OA packages have approached this method of integration of third-party applications in very different ways. Aster*x and BBN Slate require the use of their proprietary programming extension languages to invoke a UNIX window and run another application. Rapport provides a GUI to easily implement this capability.

The second approach to integration involves converting the data from a foreign UNIX application (UNIX, DOS, or Macintosh) into the native file format of the document. All OA applications include a minimum set of conversion routines for text and graphics (e.g., ASCII, EPS). Users must explicitly "import" the file, and the application converts that foreign file format into the native file format of the application. It is very common for applications to support the import and conversion of specific file formats, but not support the export of the native file format in the same manner. In other words, the conversion is not bidirectional. The conversion support provided by the products evaluated ranges from a very limited set in BBN Slate to a very sophisticated conversion architecture in Rapport.

3.1.4.1 Third Party Hardware Integration

None of the products were physically configured with the MCIA text and color graphic scanners for the purposes of this evaluation. However, an examination of the documentation and clarification from the vendor did not reveal any technical difficulties with these types of hardware integrations.

3.1.4.2 Product Comparison of Software Integration Methods

Aster*x requires the use of its ELF programming language for third-party application integration. ELF macros must be written to open a UNIX window, run an application, and include the resulting data in an Aster*x document. Normal conversion of other file formats is handled via the usual import-and-convert method. In order to do this though, the proper conversion routine must be available. Applix incorporates a minimum set of software conversion filters with the base product; other converters (i.e., Filter*Packs) must be purchased separately.

BBN Slate is designed to work in an environment with other BBN Slate users rather than integrate third-party applications. However, SEL can be used to automate functions and launch third-party applications. Although conversion routines can be attached to SEL, they would have to be written by a programmer or acquired and integrated via SEL, because BBN supports only the most basic file format conversions, such as ASCII. BBN Slate users may e-mail foreign documents as enclosures to a document without conversion. A BBN representative indicated that their priorities are to improve their interface for the next release of BBN Slate and then begin to include conversion mechanisms for integration with other applications.

Rapport integrates third-party applications by allowing the user to attach other UNIX applications to the Rapport menu by specifying the UNIX path to the application in a dialogue box. When the third-party application is selected from the menu, an inset box (or reference icon) is placed within a document at a specified location. The external application can then be launched in an X Window via the icon and the resulting data either referenced or converted into a Rapport-formatted object. If the data is converted, it is embedded directly into the document. Clarity bundles a large array of converters for the most popular UNIX, DOS, and Macintosh applications with its base product. Rapport's conversion architecture is superior to the other products. Explicit conversions are accomplished via a dialogue box. The e-mail component of Rapport supports automatic conversion of documents based upon established recipient preferences of networked UNIX users. An e-mail directory contains the preferred applications (e.g., FrameMaker, Excel) for each user, and e-mailed documents are automatically converted to the preferred file format. Rapport also supports interfaces to DOS and Macintosh mail gateways. Rapport documents maintain their compound document structure when mailed to another Rapport user. The compound elements are transmitted as separate files when sent to other users. E-mail is discussed further in section 3.2.6.

A similar conversion capability based upon user preference cannot be developed with ELF in Aster*x. In lieu of automatic conversion via e-mail, users of any of the evaluated products can transfer files via File Transfer Protocol (FTP) or access remote files via Network File System (NFS) and then explicitly convert them to another format if the conversion routine is supported.

3.1.5 System Requirements

System requirements are compared in terms of Random Access Memory (RAM), Disk Space and Swap Space as shown in table 3-1. BBN Slate appears to require much less disk space for storage of the program files. Otherwise, no significant differences were noted.

3.1.6 Graphical User Interface (GUI) Considerations

The MCIA is DODIIS compliant with a Motif interface, which all products provide as a standard feature. BBN Slate is developed in OpenLook and then ported to Motif, which has resulted in a less than satisfactory evaluation of the Motif interface.

Aster*x and Rapport have streamlined and consistent GUIs. Macintosh users will find the Aster*x and Rapport GUIs familiar. The navigation and behavior of the individual components are intuitive and easy to use. BBN Slate has received criticism for its poor user interface, especially the many inconsistencies and the necessity to access too many pop-up menus rather than include dialogue boxes which require fewer mouse clicks [3]. As stated previously, BBN Software's highest priority for BBN Slate is improving its user interface. The next release, scheduled for the third quarter of Calendar Year 1992, should make BBN Slate easier to use.

BBN Slate purports to run in an X11R5 environment now, although it does not exploit all the features provided by R5, including the font sizes and styles that the analysts require. The other two products support X11R4 with the promise of migrating to R5 in the near future.

3.2 FUNCTIONAL CRITERIA

Aster*x, Rapport, and BBN Slate provide a word processor and spreadsheet with graphing capability, a capability for creating both object-oriented graphics and images, and e-mail. Rapport also includes a slide manager while BBN Slate has a "slide show" capability for presenting briefings.

Each of the systems has a different emphasis and market focus; consequently, the individual system components have been developed to complement the vendor's objectives. These components in all three products support at least the basic capabilities required to produce a compound document. A comparison of features by module (e.g., word processing, spreadsheet, graphics, and e-mail) of each product highlights the differences. Power users who are accustomed to applications that specialize in a particular area (e.g., Microsoft Excel for spreadsheet capability) will find features missing from comparable components in integrated products. The values added by using integrated OA systems are interoperability and consistency between all component interfaces.

The following sections compare the products in terms of the word processing, graphics processing, spreadsheet, and e-mail modules of Aster*x, Rapport, and BBN Slate. Functional requirements that are present across all modules are presented first. A comparison of file conversion filters provided or available to use with the product is also presented separately.

3.2.1 Printing, Formatting and Manipulating Text, and File Management

Certain functions of an integrated OA product cannot be specifically related to a particular module. Therefore, a comparison of some of these functions is provided prior to comparing the products module by module. Printing, formatting, manipulating text, and file

management are functions that cannot necessarily be associated with a particular module, but are critical to the overall functionality of the product. Specific requirements for each of these areas are discussed below.

3.2.1.1 Printing

A comparison of printing capabilities is provided in table 3-2. Printing has been the source of some dissatisfaction with the current version of BBN Slate. The analysts have been unable to print a range of pages, consequently they have to print all or nothing.

Table 3-2. All Modules - Printing

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Printing			
(A) Print all or part of the document	√	√	√
(B) Prints highlighted selection	X	X	X
(A) WYSIWYG	√	√	√
(B) Print preview	X	X	√-
(B) Configurable print order	X	X	X
Printer Support			
(A) PostScript printing	√	√	√
(B) NonPostScript printing	X	√	X
(B) First page control (e.g., letterhead)	√-	√-	√-
(A) Portrait/landscape printing	√	√	√
(B) Configurable for envelop/label format	X	X	X
(B) Print reduction, what percents?	X	X	√ (100, 50, 25)

This is a standard feature of most packages and has since been added to the BBN Slate product, version 2.0 (beta). One difference in printing that should be noted is the ability for Rapport to print to a nonPostScript printer, at an additional charge. While this is not a required printing format, it may be significant for an environment that does not have PostScript printers available.

While all the packages offer What You See is What You Get (WYSIWYG) printing, none of the products offer a print preview mechanism for displaying the page format on the screen exactly as it will print. (Slate purports to have print preview but it was not working in the beta version being evaluated.)

A criteria to provide separate printer bins for bond/letterhead and regular paper was stated but no product fulfilled it. All products provide for a manual page feed so that the first page could be manually sent to print on letterhead and then the rest of the pages could be printed on automatic feed from the regular paper bin.

None of the packages provided envelope or label formatting. BBN Slate was the only product that provided for reduced print size selection with the print option. This feature should not be confused with reduction through changing the font size.

3.2.1.2 Formatting and Manipulating Text

Certain attributes of the word processor are carried throughout the product. These include font sizes and styles, accelerators or command key sequences for expert users, text manipulation rules, and others. A comparison of these features is summarized in table 3-3. Both Aster*x and Rapport provide a wide range of font sizes and styles to use. In addition, these two products allow the user to customize the font size of the screen display. This was another area of dissatisfaction with the current BBN Slate implementation which used a difficult to see visual size in the working environment. The analysts require fonts in excess of 24 pt for briefing slide production. These sizes were not available with the currently installed BBN Slate.

A notable difference between the products was the expert right button or smart mouse that Rapport and BBN Slate incorporated into their interface. Upon highlighting the object or text to be manipulated, the user can press the right mouse button and an edit menu appears at the mouse location. This allows the user to edit without leaving the area being edited. Aster*x, on the other hand provides an edit expressline at the top of the menu bar with cut, copy, paste, and clear functions.

An important consideration for the MCIA analysts is the ability to use many applications. This means being able to co-exist on the screen and cut, copy, and paste between applications. Aster*x and Rapport performed satisfactorily in this area, with some color degradation due to system color availability for all packages. Slate was unable to co-exist with other products, crashing regularly.

Table 3-3. All Modules - Formatting/Manipulating Text

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Font Sizes/Styles	√	√	√-
(A) Font sizes up to 24 pt minimum	36 pt	72 pt	24 pt*
(A) Multiple styles in one document	11 styles	10 styles	5 styles
(B) Color text	√=14	√=128	√=8
Keyboard Accelerators/Expert Mode			
(A) Expert keys, accelerators, or menus	√	√	√
(C) Several levels of menus based on user knowledge	X	X	X
(B) Easy to repeat last command?	X	X	X
Highlighted Text Manipulation			
(A) Replace hi-lighted text with one keystroke	√	√	√
(A) Cut, copy, and paste with mouse, menus, or command keys	√	√	√
(A) Undo the last edit	√	√	X
(A) Cut and paste from/to other applications (may be a system capability supported by app., i.e., Topic 3.1)	√	√**	√

*BBN Slate was buggy and only showed 18 pt available for pitch size; claims to go to 24 pt now.

**Rapport was not actually tested with Topic 3.1, but it co-existed nicely with Aster*x.

3.2.1.3 File Management

Table 3-4 summarizes the comparison of file management requirements. All products are able to support multiple open documents simultaneously, with BBN Slate's ability being memory dependent. Being able to merge two similar files may be important if group editing is unavailable. In that regard, Rapport and Slate are able to merge files, Aster*x can get around file merging by using cut/paste functions.

Automatic backup capability is necessary within the product, over and above the UNIX-level backup that is done on an incremental 15 minute basis. All products perform auto-backups.

None of the products include features to search files for a string of text, compare two files and list the differences, or provide password protection for a file. Since these were not "A" criteria, the existence of work-arounds for these features was not pursued with the vendor.

Table 3-4. All Module - File Management

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(A) Multiple open document windows Maximum allowable open windows (A) Hide/expose a doc with one click on it	√ Max=20 √	√ * √	√ * √-
(A) File merge two or more files	√-	√	√
(B) Search directory for document	√	√	√
(B) Auto-backup at user specified intervals	√	√-	√
File Management (B) Delete, copy, rename, move functions while in active session	√	√-	√
File Text Search (B) Search of files in any directory for words or phrases within a document	X	X	X
File Comparison (B) Compare two files and generate a list of the differences	X	X	X
(B) Passwords to protect files (read-only)	X	X	X
(B) Iconic file manager Supports unique icons for different file types	X	X	X

* Memory Dependent

3.2.2 File Conversion Filters

File conversion filters are an important consideration in evaluating integrated OA packages since all users presumably work with a diverse set of software applications, past and present. The ability to import files while preserving their native characteristics, saves time in producing final products. Table 3-5 shows the various text, spreadsheet, drawing, and image formats that Aster*x, Rapport, and BBN Slate support, either as a standard inclusion or as an option available at extra cost.

In the future, DODIIS standards for compound documents like the Office Document Architecture (ODA), which is a generic interchange architecture that uses standard generalized markup language (SGML) as one of its interchange formats, will help make it

Table 3-5. File Conversion Comparison

Conversions	Aster*X 2.0	Rapport 1.13	Slate 2.0(beta)
Text:			
(A) ASCII	I/E-Standard	I/E-Standard	I/E-Standard
(B) DCA	I/E-Standard	Future	Not Available
(B) FrameMaker (UNIX)	E-Optional	I/E-Standard	Future*
(B) Interleaf (UNIX)	I/E-Optional	I/E-Standard	Future*
(B) IslandWrite	Not Available	I/E-Standard	Not Available
(B) MacWrite II	Not Available	I/E-Standard	Future*
(B) Microsoft Word (DOS)	I/E-Optional	I/E-Standard	Future*
(B) Microsoft Word (Mac)	Not Available	I/E-Standard	Future*
(-) Office Writer (Wang)	Not Available	Future	Not Available
(A) WordPerfect 5.1 (UNIX/DOS)	I/E-Optional	I/E-Standard	Future*
(B) Enable O/A for DOS	Not Available	Not Available	Not Available
Spreadsheet:			
ASCII (comma)	I/E-Standard	I/E-Standard	Not Available
ASCII (tab)	I/E-Standard	I/E-Standard	Standard
(A) Lotus 1-2-3 (WK1, WKS)	I/E-Standard	I/E-Standard	Standard
(A) MS Excel (.SYLK)	I/E-Standard	I/E-Standard	Not Available
Multiplan	Not Available	Future	Not Available
Wingz	Not Available	Future	Not Available
Drawing/Image			
(A) CGM	I/E-Optional	Future	Not Available
DXF	I-Optional	Future	Not Available
(B) EPSI	I-Standard	Not Available	Future
(B) FrameMaker (MIF)	E-Optional	I/E-Standard	Not Available
GEM	I-Standard		
(B) GIF	I-Standard	I/E-Standard	Not Available
(B) HPGL	I-Standard	Not Available	Not Available
(B) IGES	I-Optional	Future	Not Available
(B) Interleaf	I/E-Optional	I/E-Standard	Not Available
Island Draw	Not Available	Future	Not Available
IslandPaint	Not Available	Future	Not Available
MacPaint	I-Optional	Future	Not Available
Windows 3.0 Metafile	Not Available	I/E-Standard	Not Available
(A) PCX	I-Optional	Future	Not Available
(B) PICT	Not Available	I/E-Standard	Not Available
(A) TIFF	I-Standard	I/E-Standard	Future
(B) WordPerfect(WPG)	Not Available	I/E-Standard	Future*
(B) Xbitmap	I/E-Standard	Not Available	Not Available
(B) XWD	I-Standard	Not Available	Import Only
Sun Raster	I/E-Standard	I/E-Standard	Import Only

Legend: I/E - Import/Export, I - Import, E - Export

*Future partnership with KeyWord

**Aster*x Version 2.0 only provides 7 bit (128 color) support. When importing a B/W SUN raster file using OpenWindows' Snapshot tool to cut imagery from ELT2, the image quality was significantly degraded. Color imagery is not degraded when imported into Aster*x. Eight-bit support is forthcoming in 4 Q/CY92 Version 3.0.

possible for different compound document systems to interoperate. Since the formal standards to support data interchange services for the exchange of documents and images have not yet matured, several other standards are important. The DODIIS standards for spreadsheet file formats are .WK1 and .WKS, the Lotus 1-2-3 file formats. The Tagged Image File Format (TIFF) is the DODIIS standard for raster images in compound documents. However, some product developers only partially support TIFF 5.0, which has four parts–one for defining a black and white image, one for defining a gray-scale image, one for coding and defining a color map for an image (limited to 256 colors), and one for defining a full red-green-blue (RGB) image. Rapport is the only one of the products evaluated that fully supports TIFF 5.0. The Computer Graphics Metafile (CGM) is designated to become the government standard for storing vector graphics, but currently it is unusual for OA applications to support (i.e., both import and export) CGM files fully. The Encapsulated PostScript (EPS) format can contain both raster and vector information.

Aster*x has a robust set of filters which can be purchased separately, namely the Word Filter*Pack, Graphics Filter*Pack, and the Publisher Filter*Pack. However, Aster*x emphasizes importing files rather than exporting. Rapport bundles a robust set of filters and advertises that it will provide any other filters needed by a large customer to convert historical files, provided they can obtain the rights to the conversion routine.

BBN Slate is entering into a partnership agreement with KeyPack to develop the interface with a product called KeyWord. This partnership will provide the filtering capability for many file formats. A small number of standard filters are currently included in the BBN Slate product. Therefore, in evaluating the filters provided with each product, BBN Slate was eliminated almost immediately due to the lack of filters included with the product.

3.2.3 Word Processor Comparison

The word processing module is possibly the most essential module of an integrated OA product. Word processing has grown from being just a text entry point to a publishing tool with formatted style sheets or templates that can be used to save particular formats that are used often. The MCIA analysts are most familiar with WordPerfect for DOS and UNIX. Others relate to Microsoft Word 4.0 when specifying requirements for a word processor.

Within the word processing module, functional requirements are separated into text formatting and manipulating, syntax, desktop publishing, and miscellaneous features.

3.2.3.1 Text Formatting and Manipulating

The processes of text formatting and manipulating are comparable across the three products evaluated, with subtle difference explained. All products use styles, style sheets, or style guides to achieve specific formats and functions requested by the analysts. Table 3-6 summarizes these features.

Table 3-6. Word Processing - Text Formatting

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Style Sheets			
(A) Define style sheets including font, point size, indents, line spacing, and justification	√	√	√
(A) Change default style sheet while editing and apply the default	√	√	√
(A) Add different styles to documents or change a style	√	√	√
Text Justification			
(A) Left, right, and center text justification	√	√	√
(B) Center text vertically	√	X	X
Text Formatting			
(A) Supports continuous underline	√	√	√
(B) Supports broken underline	√	X	X
(B) Supports double underline	√	X	√
(B) Supports strike-through	√	√	√
(B) Supports small capital letters	X	X	X
(A) Displays margin control/ruler	√	√	√
(A) Able to show/hide format markings (i.e., carriage returns, spaces, tabs, etc.)	√	X	X
(A) Allows automatic repagination	√	√	√
(B) Widow control for paragraphs/headings	√	X	√
(B) Allows text wrap in specified area	X	X	X
(B) Varied page length/size in one document (legal and letter, portrait and landscape)	X	X	X
(A) Supports alternate alphabets	√	Future	Extra cost
(A) Headers/footers	√	√	√
(A) Supports templates with locking fields	√-	√-	√
(A) Extract data from templates easily			

Some of Aster*x features, such as the table of contents and numbered lists, are available only through the Aster*x style guide feature. A style guide is a reusable set of formatting instructions for different types of documents (similar to templates). However, unlike standard templates, Aster*x style guides keep track of hierarchical relationships between sections of a document, making it easy to rearrange sections and subsections. Style guides are provided for letters, reports, newsletters, memos, and outlines. Minor changes can be made to existing style guides but only a power user should attempt to create one from scratch [4].

The Rapport word processing component meets basic document preparation needs. However, if a full-featured word processing or desktop publishing application is required, that application can also be directly accessed from Rapport. The resulting document may be mailed via Rapport to other users.

The BBN Slate word processor has extensive support for foreign language word processing (at substantial extra cost), including a "transliterate" function for document translators [5]. A multilingual option must be purchased with the base product, then language packages can be purchased for (1) Arabic and Hebrew, (2) Thai, (3) Korean, and (4) Russian. Aster*x has international dictionary support that can specify the language used by the dictionary for spell-checking as well as by the thesaurus. Sixteen dictionaries are available including English, German, French, Spanish, Italian, British, Swedish, Danish, Norwegian, Dutch, Portuguese, Brazilian, Canadian, Swiss, Nynorsk, and Finnish. Clarity indicates they will provide full word processing support for foreign languages, but within the next six months only French and German are planned. Support for Italian, Spanish, and Japanese will follow.

The ability to format templates with locking fields is important at the MCIA. These templates are used to provide on-line forms of various types to the analysts. All products can provide templates through the use of style sheets, although a certain amount of discipline will have to be instilled since they cannot be locked.

3.2.3.2 Syntax Requirements

Syntax requirements are the mechanics of word processing, such as spelling, hyphenation, and alternate term definition (table 3-7). All the products provide a spell checker and all products allow the user to add words to the dictionary. Aster*x and BBN Slate allow the user to spell check a particular word by clicking on it and applying the spell checker. Rapport requires the user to click before the word and activate the spell checker. The Rapport spell checker will then continue until the user cancels it.

Aster*x provides the most robust hyphenation features of the three products, allowing automatic and soft hyphenation, and the option for no hyphenation. Aster*x also provides the only thesaurus capability of the three products. None of the products provide a grammar checker.

3.2.3.3 Desktop Publishing

Desktop publishing features (table 3-8) are those normally found in a product such as PageMaker or FrameMaker and are necessary for developing quality reproducible documents. The extent of these capabilities are not as necessary at the MCIA since they have recently employed a professional graphics artist. This person will need a specialized product to produce final published documents. Draft documents produced by the analysts will have to be compatible with the desktop publishing software used by the graphics artist.

Table 3-7. Word Processing - Syntax Requirements

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(A) Spell checker (A) Able to define alternate dictionary or add terms	√ √-	√ √-	√ √-
(A) Spell check entire or partial document	√	√-	√
(B) Hyphenation toggle (B) Customize hyphenation of words	√ X	X X	X X
(B) Thesaurus with antonyms	√	X	X
(B) Customizable grammar checker	X	X	X

A substantial consideration in desktop publishing is the ability to do columnar editing. Aster*x was the only product that provides columnar editing as an inherent feature. The other two products would manipulate the spreadsheet columns without the capability to wrap text or grow with additional text.

None of the products have a table generation feature within its word processing component, but all can produce tables using the spreadsheet component. Aster*x will support boxed text areas (similar to table generation in Microsoft Word) in their version 2.1. Rapport creates boxed text by using the spreadsheet borders feature as a work-around.

Rapport lacks basic features such as table of contents generation or footnote generation. BBN Slate includes these features, but the evaluation found them to be buggy in the beta version.

Aster*x allows the generation of change bars in the margin to denote revisions to text. Rapport would allow the user to redefine the margin to add a revision character, but it is not an inherent feature.

Integral to desktop publishing is the ability to insert graphics within the text. Since Aster*x is more loosely integrated, a user could first import graphics into the graphic module, manipulate, edit, and then paste the graphics into the Aster*x text processing module. Aster*x does not automatically size the graphic to the specified area, but pastes the overflow portion down a space. Rapport and BBN Slate both manipulate graphics and spreadsheets as integral parts of the document, and both perform sizing and editing through a menu or through floating tool palettes.

Table 3-8. Word Processing - Desktop Publishing

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Column Manipulation			
(A) Multicolumn text	√	√-	√-
(B) Adjustable gutter widths	√	√-	√-
(B) "Snakes" text between columns	√	X	X
(B) Banner headings or text	√	X	X
(B) Balances columns horizontally	√	X	X
(A) Supports revision markings in margin	√	√-	X
Spreadsheet/Graphics integration			
(A) Import graphics and retain original color, monochrome, or gray-scale properties	√	√	√-
(B) Draw lines and arrows	√-	√	X
(B) Insert spreadsheet with all it's attributes	√	√	√
(A) Expandable text boxes (table generation)	X	√-	X
(B+) Rotation of text, kerning, and tracking (kern - adjust space between letters, track - the amt of space between letters)	X	X	X
(B) Automatic index generation	√	X	X
(B) Cross referencing	X	X	√
(A) Table of contents generated from outline	√	X	√-buggy
(A) Footnotes/endnotes with text superscripts	√	X	√-buggy

None of the products were found to support rotation of text in the word processing module. Text created in the graphics module could be rotated as explained further below. Aster*x was the only product that does automatic index generation. BBN Slate performs cross-referencing.

3.2.3.4 Miscellaneous Features

The ability to search and replace automatically or on a case-by-case basis is required. All three products have the ability to search and replace text. Rapport provides the ability to search in the forward direction only. BBN Slate has the added capability of searching text, images or spreadsheets for a string.

Another important feature is the ability to group edit or conference-edit on documents. BBN Slate is the only one of the three products that supports document conferencing, which allows several users to collaborate on a document simultaneously. Users in geographically dispersed areas can view and modify compound documents as a group. All participants have local copies of the document showing all changes made during the conference. BBN Slate contains a wide range of character, paragraph, and list formatting styles and many other good word processing features. However, there are many drawbacks or constraints. In addition to the lack of support for file format conversion and the inadequate GUI mentioned previously, BBN Slate permits only one document window to be visible at a time. If multiple files are opened, each has its own buffer and a pop-up menu must be used to switch between them.

Aster*x allows more than one user to simultaneously open the same document but does not keep track of saved versions, so the users run the risk of saving on top of a revised copy. Rapport at least informs the user that the document has been edited and allows the opportunity to change the filename.

Table 3-9 summarizes the miscellaneous and processing features of Aster*x, Rapport, and BBN Slate.

Table 3-9. Word Processing - Miscellaneous Features

Description of Criteria	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(A) Search and replace capability (Backward or forward, repeatable, replace, and verify each occurrence)	√	√-	√+
Numbering/Sorting Lines of Text (B) Number lines on part/entire document (B) Sort all or part of a document by line (alphabetically or numerically)	√- X**	√- X	√- X*
(B) Group editing (conferencing)	X**	√-	√+
(B) Collapsible outline generation Outline can be expanded or reduced Supports hidden text and customized numbering schemes	√+	√	√
(B) Bookmark placement within text	X**	X	X*
(B) Mail merged form letters	√	X	X*
(B) Form letter options Allows selection of form field from menu	√-	X	X*

* BBN Slate is able to provide these features using the Slate Extension Language.
** Aster*x is able to provide these features using the Aster*x Extension Language.

3.2.4 Graphics Module Comparison

The graphics modules feature graphics manipulation, image processing, and printing. Table 3-10 compares the vector graphics and image processing features of Aster*x, Rapport, and BBN Slate. Vector graphics, those created in drawing applications, are stored as mathematical formulas. Image or raster files are stored as bits representing pixels. Raster files contain images created in paint applications and scanned images. Refer to table 3-5 for a complete list of graphic and image filters supported by the evaluated products.

Table 3-10. Graphics Component Comparison

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Color Image Editor	√	X	X
Color Image Display	√	√	√
Color Graphics Editor	√	√	√
Image Cropping	√	√	√
Image Scaling	√	√	√
Gray Scale Graphics Editor	√	√	√
Gray Scale Image Editor	√	X	√
Screen Capture Tool	√	√	X

Although Aster*x primarily supports the creation of vector objects, a 125-color pixel editor has recently been added. Aster*x also supports conversion of objects into black-and-white bitmaps using a macro [4]. All products support image scaling and allow images to be cropped. Rapport compensates for the lack of paint features by converting many image formats and capturing images displayed on the screen.

Aster*x provides a digitizer tool in the graphics module tool palette that can copy a portion of a vector graphic and convert to raster format. Rapport has a similar screen capture feature provided in the menu.

Aster*x and Rapport have screen capture tools that allow a portion of a window to be copied into a document by dragging the mouse over the area to be captured. However, more functionality is provided in Rapport. Aster*x can only capture areas displayed in an Aster*x window. The Rapport screen capture facility can capture an area from any window displayed on the workstation. All of the products allow images captured through the X Window Dump (XWD) utility in X to be placed within a document, but XWD captures everything in a window with no provision for selecting only a portion of the window.

3.2.4.1 Draw Tools

The drawing module of all three products supports basic features with a standard assortment of tools to create lines, arcs, circles, boxes, ellipses, and freehand lines. Tools are presented in two distinct fashions. Aster*x displays the tool palette as an integral part of the graphics module, at the top of the screen, while the other two products provide a graphics tool palette that floats and incorporates the smart right mouse button to edit with. All can perform the usual functions of aligning, grouping, and filling objects. BBN Slate cannot rotate objects, while Rapport can rotate vector objects but cannot rotate image objects. Aster*x has the ability to rotate any object by specific degrees.

Table 3-11 summarizes the drawing features of Aster*x, Rapport, and BBN Slate.

Table 3-11. Draw/Paint Tools Comparison

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0(beta)
(A) Draw tools, how many presented	5+text & digitizer (fixed palette)	7+text (floating palette)	12+text (floating palette)
(A) Text editing	√	√	√
(A) Fill patterns	12	36	24
(A) Line attributes	5 widths/arrows	4 widths/arrows	4 widths/arrows
(A) Color attributes	14 colors	128 colors	8 colors
Background fill	√	√	√
Transparent/opaque objects	√	√	√
(A) Resize objects	√	√	√
(B) Zoom ability	√ x2, x4	√ in, out	X
(A) Rotate objects			
Image rotating	√+	√	X
Object rotating	√+	X	X

3.2.4.2 Briefing Slide Generation

While the capability to generate briefing slides was a "B" criteria, production of presentation graphics can be a tedious job with the current capability provided by Harvard Graphics. With the advent of Microsoft PowerPoint in both DOS and Macintosh environments, slide manager software is an efficient addition to workstation productivity tools.

The three products evaluated all propose support of slide generation in different ways with Rapport providing the most distinct module. The slide creation and slide manger features in Rapport are impressive. Rapport slides are individual graphic presentations that are created using any of the graphics and text object modules, including sound. The converters permit graphics, images, or spreadsheet charts from other packages to be incorporated into a Rapport slide. Hot links between modules (e.g., a Rapport chart and spreadsheet) are maintained, and editing tools can be used in the slide show mode. Overhead transparencies and 35 mm slides can be created as well. A remote capability in version 1.13 allows the user to manually flip through a slide show or automatically flip slides at specified intervals.

BBN supports slide shows via a SEL macro activated at the keyboard; it is included with the base product in version 2.0. Slides can be created in Aster*x by using a template or style sheet, however, no inherent slide manager exists in the current version of the product.

3.2.5 Spreadsheet Module Features

Table 3-12 compares the spreadsheet features of Aster*x, Rapport, and BBN Slate. These spreadsheet components offer standard capabilities, however, they lack the full functionality of a dedicated spreadsheet program. For example, BBN Slate has a limited number of cells. Aster*x lacks different fonts. Rapport lacks global search and replace.

Table 3-12. Briefing Slide Generation

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(B+) Slide Generation Features			
Slide show	X	√+	√-
Slide templates	√	√	X
Slide master	X	√	X
Slide reorder ability	X	√+	X
Attach audio output	√-	√	√

Spreadsheet features can be divided into two related groups, those features associated with manipulation of data on the spreadsheet and those features associated with graph generation from spreadsheet information.

3.2.5.1 Spreadsheet Manipulation

Requirements for spreadsheet functionality are drawn from the experience of using other powerful spreadsheet products (e.g., Microsoft Excel and Lotus 1-2-3). Aster*x proved to be the most robust spreadsheet module of the three products. Rapport has the ability to create

graphics using draw tools within a cell or group of cells, and to shade cells with background color or pattern fill. Only Aster*x and BBN Slate have the ability to delete discontinuous cells of data.

None of the products could wrap text within a cell, superimpose text boxes on top of cells, or attach notations to cells. These are features supported in the latest version of Microsoft Excel, a much more powerful stand-alone spreadsheet product.

Both Aster*x and Rapport feature alternative navigation options within the spreadsheet, which provides more flexibility. The cursor, scroll bars, arrow keys, tab, or enter keys may be used to move around a spreadsheet. In Rapport, scrollbars can be left on the spreadsheet object even when it is e-mailed so that it can extend to its full size when accessed by the recipient. An Aster*x spreadsheet, on the other hand, can be no wider than the document in which it resides and will be truncated on the right [4].

All spreadsheet components allow the user to simultaneously see the formula and result displayed. Only Aster*x was able to print a list of formulas by cell addresses. Aster*x also provides a weak cell locking feature called "protection," while the other two products both provide stronger cell locking features. Aster*x and Rapport have comparable mathematical functions with at least 16 mathematical, 5 statistical, 3 logical, and 3 financial functions. BBN Slate provides 87 functions.

Table 3-13 summarizes the spreadsheet manipulation functions of Aster*x, Rapport, and BBN Slate.

Table 3-13. Spreadsheet Manipulation

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
Spreadsheet Text Manipulation			
(A) Flexible column/row sizing	√-702/9999	√-702/8192	√-256/2048
(A) Relative/absolute cell addressing	√	√	√
(A) Globally search and replace	√-	X	X
(A) Row/column justify/insert/delete	√	√	√
(A) Partial view of spreadsheet	√-	√	√
(A) Range specification/editing	√	√	√
(A) Cell formatting	√	√	√
(B) Hot links to other modules	√	√	X
Mathematical Functions			
(A) Display/print list of formulas	Both	Display only	Display only
(A) Number of functions available	39	39	87
(A) Statistical functions	√	√	√
(B) Background recalculation	√	√	√

3.2.5.2 Charting Capabilities

The ability to select a range from a spreadsheet and create a number of different graphs was tested. In the case of Aster*x, the spreadsheet component is a separately priced module while the other products bundle the spreadsheet with their basic product. Aster*x, however, has more functionality than the other two products.

Through simple editing functions, the Aster*x user can cut and paste a portion of the spreadsheet on the same page with the graph. The default graph is a comparative bar graph and can be easily changed. The user can also cut and paste more than one type of graph on the same page. Aster*x offers a menu driven chart customization feature that allows the user to format titles, notes, legends, and data points. Rapport, on the other hand offers all of these details but the user formats them individually, directly on the graph.

All three systems maintain hot links between the graph or chart and the spreadsheet from which it was generated. If the spreadsheet is changed the chart is updated as well. BBN Slate, does not provide the same level of interaction with its other components, such as the word processor, as the other two products.

Functionality in other areas also differs between the products. Although Rapport supports the specification of a range within a spreadsheet for calculations or chart creation, the range cannot be assigned a name for future use. A range can be assigned a name in Aster*x and BBN Slate. Aster*x and Rapport allow a portion of a spreadsheet to be displayed or viewed when the entire spreadsheet is not needed, while BBN Slate does not.

None of the products supported two dimensional or three dimensional presentation (similar to the features in MicroGraphix Spreadsheet product).

Table 3-14 summarizes the charting capabilities of Aster*x, Rapport, and BBN Slate.

Table 3-14. Charting Capabilities

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(A) Print graph and spreadsheet together	√-	√	√
(A) Legends, titles, and notes	√+	√-	√-
(A) Supports different chart styles	√	√	√
(A) Data point presentation	√	√	√
(B) Hot links to graphs	√	√	√
(B) 2-dimensional (C) 3-dimensional	X	X	X

3.2.6 Electronic Mail Features

Within the DOD, the Internet suite of application protocols (i.e., Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Telnet, Domain Name System (DNS)) will serve as costandards until transition to Open Systems Interconnection (OSI) is complete. The application within the Internet suite pertinent to e-mail is SMTP. The Internet Activity Board oversees the development and subsequent documentation of Internet protocols in the Request for Comment (RFC) series of documents. The RFC applicable to SMTP is RFC 822, "Standard for the format of ARPA-Internet Text Message" or format of e-mail message. Aster*x, Rapport, and BBN Slate all comply with RFC 822. It is also important that there be a migration path to X.400, the Message Handling Service under OSI. Vendors currently are using the gateway approach to convert e-mail to X.400 format. Clarity is the only vendor of the three evaluated e-mail components who is currently developing software for X.400 compliance. Clarity also has developed software support for other UNIX gateways to interface with DOS and Macintosh users.

The e-mail components of both BBN Slate and Rapport are tightly integrated with the OA system, so it would not be possible to substitute another e-mail product such as Poste. The e-mail component of Aster*x is optional. Aster*x's ELF is most limited when dealing with e-mail customization and programming. It is possible to turn off Aster*x e-mail and write an ELF interface to another e-mail product.

Table 3-15 presents the features of the Aster*x, Rapport, and BBN Slate e-mail components. The Rapport e-mail component has more options than the others. According to another evaluation [3] Rapport's e-mail system of filters and file conversions exceeds anything else on the market. BBN Slate has the most mathematical functions.

The automatic disposition filters in Rapport will intercept both incoming and outgoing e-mail and process it according to "rules" that the user has previously specified. Based upon pattern matching in the mail header, mail filters can automatically act on incoming messages. For example, messages can be prioritized, sorted, or forwarded if the recipient is going to be away. Outgoing mail is processed based upon entries in Rapport's global and personal directories. In addition to names and e-mail addresses, the directories contain the preferred document formats (e.g., FrameMaker, Excel) and automatic conversion routines convert e-mailed documents to the recipient's preference profile. Other Rapport users receive live compound documents with their structure intact. When DOS and Mac users are networked to a UNIX network via the gateways Clarity supports, documents sent to them are converted as well. Those who are profiled as FAX users receive their mail via FAX. Inbound mail is automatically reconverted to your profiled format, which may not necessarily be Rapport if you have specified a nonRapport editor. For example, another paint application could be "attached" to your Rapport menu and specified as your preferred image application.

Table 3-15. Electronic Mail Capabilities

Feature	Aster*x 2.0	Rapport 1.13	Slate 2.0 (beta)
(B) Aliases	√	√	√
Automatic disposition filters	X	√	X
Automatic conversion filters	√	√	X
(B) Blind copies (BCC)	√	√	X
(A) Distribution list (global/personal)	√	√	X
(B) Distribution list profiles	√	√	X
(B) Forwarding based on subject	√-	√	X
Gateway Support:			
(A) UNIX Sendmail (SMTP)	√	√	√
X.400	X	Future	X
cc:Mail (DOS/Mac)	X	√	X
GatorMail to QuickMail	X	√	X
GatorMail to Microsoft Mail	X	√	X
(B) Multiple mail folders	√	√	X
(B) New mail notification	√	√	X
(B) Return/read receipts	√	√	X
Search/sort	√	√	X
Priority messages first	X	√	X

The e-mail components of Aster*x, BBN Slate, and Rapport are much more than simple text-based messaging systems. In basic e-mail systems, compound documents are disassembled and sent as separate files. The mail clients of these products are much more sophisticated. In order for the compound document to be received with all of its elements in their proper place, the various elements, or objects, must be encoded within a single data file that can be correctly decoded when the mail is read.

BBN Slate can only mail compound documents to other BBN Slate users. In Aster*x, non-Aster*x files can be sent and received as attachments. An ELF macro combined with an undocumented configuration file can be used to determine the file format based on the file extension and to perform any Aster*x or UNIX operation on this file, such as conversion or saving to a specific directory.

3.3 VENDOR/OTHER EVALUATION RESULTS

Over and above the operational and functional criteria that were evaluated, the vendors of each product were evaluated in terms of their stability and responsiveness. Finally, this section provides licensing and pricing information which is dated and should be used carefully, since it was gathered for a specific customer with specific circumstances.

3.3.1 Vendor Stability

Vendor stability includes number of years in the business and number of years that this particular product has been on the market, the version of software, and when the next version is planned for release.

Applix has been in the business since 1983 with the first Aster*x product release in 1990. The current version (2.0) was evaluated. The next version release (2.1) is planned for October 1992. This version will include bug fixes, enhanced filter packs and improved floating licenses. Version 3.0 is planned for January 1993 to include briefing slide capability and improved e-mail addressing. Approximately 15,000 licenses are distributed in the United States.

Clarity began business in 1990 specifically to develop and market Rapport, which was released in 1991. The current version 1.13 was evaluated, while the next release (1.2) is scheduled for incremental release in September 1992, November 1992, and December 1992. New releases shall include extensibility, DEC5000 and IBM RS6000 support, document conferencing, and any file filters requested by current customers. Approximately 4300 licenses have been distributed.

BBN, Incorporated began business in 1940. The first release of the BBN Slate product was in 1989. The current beta version 2.0 is scheduled for market release in the third quarter of calendar year 1992. Version 2.1 is planned to include KeyPack filters and other minor enhancements. Approximately 2500 licenses have been sold.

3.3.2 Vendor Support

Applix, Clarity, and BBN all have hot lines for users to call to get assistance, although it must be purchased separately through various maintenance packages. The hotline hours are as follows: Applix, 0800 to 2000 hours Eastern Standard Time (EST); Clarity, 0900 to 2100 hours EST; and BBN maintains a hotline during normal EST business hours only. The BBN representative indicated that many BBN Slate users would obtain help from their respective system integrators if the basic product has been modified.

The representatives contacted at Applix, Clarity, and BBN during the course of this evaluation were very helpful and provided both information and written material in an expeditious manner.

All vendors offer training support both at their training facilities and at the client's site.

3.3.3 Pricing and Licensing

Table 3-16 presents the pricing structure and licensing policy for each of the products, based upon a volume discount for 60 licenses. All of the evaluated products except BBN Slate are on the Government Services Administration Schedule. BBN Slate is on the NETCAP Air

Table 3-16. Vendor Pricing Structure

Item Description	Unit Price (60 Licenses)
Aster*x [per license]	
Base (Words, Graphics, Macros)	$521.00*
Spreadsheets	$371.00
Mail	$146.00
Words*Pack Conversion Filter	$221.00
Graphics*Pack Conversion Filter	$221.00
Publishers*Pack Conversion Filter	$221.00
Standard Documentation Set	$47.00
ELF Documentation Set	$95.00
Foreign Languages	$80.00
Maintenance (Hotline Support)	$133.88
ELF Developer Support (per programmer)	$3,500.00
Training	$1,500.00/day
Rapport [per license]	
Base (All Components)	$644.00
User's Guide	$80.00
Maintenance (Hotline Support/Product Updates)	$121.00
FAX Server Copy	$1,095.00
Training	$1,000.00/day
BBN Slate [per seat]	
Base (all components)**	$700.00
Documentation Set	$125.00
Multilingual Option and First Language Package	$1,900.00
Second, Third, or Fourth Language Package	$750.00
Multilingual Documentation	$30.00
Maintenance (Hotline Support/Product Updates)	$195.00/yr
Multilingual Maintenance (15% of Multilingual Software)	$285.00
Training	$2,400.00/day

*Aster*x basic license procured through the AMHS program
**BBN Slate upgrade provided free of charge

Force Commodity Contract, which is open to the intelligence community. BBN Slate would be provided free of charge to MCIA as part of the on-going maintenance support that is currently on contract.

Applix and Clarity provide "floating licenses," which allow a large population of users to use the software but restrict the number of simultaneous users to the number of licenses purchased. BBN Slate has no license manager software, so licenses are purchased for individual workstations on a "per seat" basis. A "floating license" arrangement is far more economical than a "per seat" license.

SECTION 4

SUMMARY

4.1 PRODUCT PLUSES AND MINUSES

In the operational arena, Aster*x and BBN Slate support the desired platforms, Rapport will soon follow. Rapport and BBN Slate both supply the desired modules in a bundled fashion. Aster*x charges extra for the spreadsheet, e-mail components, and Filter*Pack. Aster*x and BBN Slate are both extensible through their proprietary programming languages. The level of expertise needed to program with these languages is probably greater than that found in the average user group of the OA package. Aster*x and Rapport are able to coexist with third party software while BBN Slate crashes regularly. All support Motif, but BBN Slate is less reliable in Motif than in OpenLook.

BBN Slate has had a poor history of printing control and font size control, both of which are promised fixes. BBN Slate and Rapport have a smart right mouse button.

File conversion filters for text, spreadsheet, and graphics (vector and image) revealed a great difference between products. BBN Slate has very few standard filters to offer. Future releases will offer a filter pack of sorts at an additional charge. Aster*x provides a wide variety of filters bundled by module type at an additional cost. They also promise improved filters in future releases. Rapport provides the most robust set of filters bundled with their product. Their focus is in working across heterogeneous environments.

In the word processing module, basic word processing functions are comparable. BBN Slate provides the required templates with locking fields. Aster*x provides the only hyphenation and thesaurus capabilities of the three. Aster*x also contains the only real desktop publishing characteristics in terms of column formatting, revision markings, and index, table of contents, outline, and footnote/endnote generation. BBN Slate provides the best conferencing or group editing features.

In the graphics module, all three products were comparable in their editing tools with the exception of a digitizer tool offered by Aster*x. BBN Slate offers fewer colors and cannot rotate objects or images, or zoom in and out. Rapport offers the only slide manager, the other two products simply use their graphics capabilities to build slides.

In the spreadsheet module, all three packages provide less functionality then a dedicated spreadsheet program. Each package has its pluses and minuses. Aster*x provided good charting and linking, but has restricted the font to one size. Rapport provided the ability to draw and enlarge a cell, but it did not provide global search and replace. Slate provided a large number of mathematical functions, but lacked global search and replace.

In the e-mail module, Rapport clearly leads the pack. Rapport is designed to send and receive heterogeneous types of files and to profile users so that specific software formats are

saved and delivered with those files. The currently installed version of BBN Slate required a lot of integration with UNIX sendmail in order to provide e-mail capabilities in the MCIA. Aster*x has e-mail but interacts best with other Aster*x users.

Clearly vendor support is an important aspect. Aster*x and Clarity were very helpful, obviously eager to add more government agencies to it's list of customers. BBN Slate has never professed to being a shrink-wrapped product and, therefore, the user loses some of the support structure characterized by a shrink-wrapped company. Certainly the technical support is knowledgeable but unwilling to incorporate obviously necessary fixes into regularly scheduled revisions of the software.

Although not a primary consideration, availability and cost of the software is a factor. BBN Slate would provide the update (2.0) to the MCIA, when released, at no charge due to the on-going maintenance/upgrade agreement. However, the MCIA analysts have such an unfavorable impression of this software already, using BBN Slate as a long-term solution is unlikely. On the other hand, Aster*x will be provided (partially) by the AMHS program, to be delivered in FY93. Therefore, the analysts will be required to learn the interface anyway. The additional cost of procuring the spreadsheet and e-mail components, as well as any additional file conversion filter packs, must be considered. Rapport's cost, while reasonable if procuring a brand new system, cannot compete with the other two product options.

4.2 EVALUATORS' IMPRESSIONS

A subjective impression of each package is provided, strictly as one point of view amongst many. This view encompasses the ease of installation, the ease of use, and the overall impression of multimedia success. Aster*x received high marks in ease of installation and use. The feel of the software is much more familiar to those used to jumping from a word processor to a spreadsheet, then to a graphics package, and back to a word processor. Aster*x provides separate work areas for separate sorts of work. The ability to glue any or all parts together in one document, or save pieces separately to be used again at a later date, is a standard way of processing information.

The Rapport and BBN Slate interfaces take some getting used to; although the efficiency of creating one giant multimedia document has it's advantages. Rapport, in particular, is a product to be given serious consideration. Although a relative newcomer to the OA product market, it has captured some of the best features of productivity software and bundled them very attractively. A lot of thought and development went into this product, most certainly, interoperability being the underlying foundation.

4.3 SUMMARY

Although Aster*x, Rapport, and BBN Slate are all integrated OA systems, they are different in a number of respects. Each of the products evaluated exhibits strengths in the areas that the system was designed to address. All of the systems feature basic functionality in each of their components, but because they each appeal to a different market niche, their ability to meet required needs depends on the perspective of the using organization.

Applix has designed Aster*x as an application with programming facilities that permit additional features to be added. The focus for Aster*x in the past has been on single-user document preparation rather than interoperability with other users. Applix just recently added an optional e-mail component and provides this capability. The features provided in Aster*x fall between low-end word processors and high-end technical document publishing systems. Applix provides some file format converters with the base product and makes a larger set available at extra cost. The Aster*x ELF provides the capability to modify the Aster*x interface, integrate other software if it resides on the user's workstation, and add FAX, video, and voice annotation capabilities. Even though ELF is relatively easy to use, it still requires learning a language-specific syntax and some understanding of basic programming. Unless Aster*x fits the needs of an organization without modification, a staff of programmers or "super users" must be available to customize this product. At some point during ELF development, Aster*x ceases to be a COTS product.

Clarity designed Rapport to coexist in a heterogeneous environment with UNIX, DOS, and Macintosh platforms and bridge them through an interoperable conversion architecture through the e-mail system. Rapport's architecture allows editable compound documents (including audio and video insets) to be transmitted among networked users. Clarity has not tried to compete with high-end document preparation applications, but instead has made it simple to "plug" those applications into Rapport through its menu. Rapport provides versatility for organizations that do not wish to "standardize" the selection of an OA product, but want to allow teams of users to work with the applications that suit them best, but still have interoperability with other users on the network.

BBN Slate has not evolved to a point that enables it to compare favorably with Aster*x and Rapport. BBN designed BBN Slate for a homogeneous environment with the primary focus on document conferencing within workgroups of BBN Slate users. It will be some time before BBN is able to offer the interoperability features provided in Rapport. They have not begun development on a version that will incorporate the conversion routines that enable BBN Slate to compete with Aster*x and Rapport. BBN Slate provides good document preparation features that fall between low-end word processors and full-featured word processors. The spreadsheet component is not as comprehensive as the spreadsheet components of Aster*x and Rapport.

The selection of one of these products must be driven by specific organizational requirements and the environment in which the system must reside. Table 4-1 presents some circumstances and an indication of which product might be suitable for a particular circumstance. Suitability is based upon capabilities that require no additional programming to develop or integrate the capability.

As previously mentioned, the MCIA detachment in Quantico, Virginia, chose Aster*x as their OA package. Since September 1992, they have been using Aster*x with satisfactory results.

Table 4-1. Product Suitability

Circumstance	Aster*x	Rapport	Slate
Is there an existing base of DOS and Macintosh computers with which users must exchange files?	√	√	
Is there a mail gateway to DOS and/or Macintosh networks?		√	
Is there an existing base of other UNIX office automation software?	√	√	
Is real-time document collaboration required?			√
Is there a requirement for end-users to add other UNIX software applications to the menu?	√	√	
Is there a requirement for extensibility and customization?	√		√
Is a slide presentation feature required?		√	
Are voice annotations required in documents?	√	√	√
Is there a requirement to create and edit color images?	√		
Is there a need for a integrated package?		√	√
Is there a need for a modular package?	√		
Is there a requirement to capture portions of an image (e.g., maps) from another application?		√	
Is strong vendor support important?	√	√	√

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GLOSSARY

ACRONYMS

ADP	automated data processing
AMHS	Automated Message Handling System
BBN	Bolt, Beranek, and Newman, Inc.
CGM	Computer Graphics Metafile
COTS	commercial off-the-shelf
DOD	Department of Defense
DODIIS	Department of Defense Intelligence Information System
DNS	Domain Name System
ELF	Extended Language Facility
EPS	Encapsulated PostScript
EST	Eastern Standard Time
FTP	File Transfer Protocol
GOTS	government off-the-shelf
GUI	Graphical User Interface
IOC	initial operation capability
MCIA	Marine Corps Intelligence Activity
MCIC	Marine Corps Intelligence Center
MCICIS	Marine Corps Intelligence Center Intelligence Systems
N/A	not available
NFS	Network File System
OA	Office Automation
ODA	Office Document Architecture
OSI	Open System Interconnect
RAM	Random Access Memory
RFC	Request for Comment
RGB	red-green-blue
SEL	Slate Extension Language
SGML	Standard Generalized Markup Language
SMTP	Simple Mail Transfer Protocol

TIFF	**Tagged Image File Format**
USMC	**United States Marine Corps**
WYSIWYG	**What You See Is What You Get**
X	**X Window System**
XWD	**X Window Dump**